

NIEHS and CDC Track Human Exposure to Endocrine Disruptors

Environmentalists blame them for diminished reproductive capacity of male alligators in the Florida Everglades. European health officials want them banned from livestock and poultry feed before they will allow the importation of meat from the United States and Canada. They're endocrine disruptors, a class of chemicals with the proven potential for disrupting human endocrine functions, including reproductive effects. Environmental groups are calling for the regulation of these chemicals, but commercial interests who depend upon them for such activities as stimulating livestock growth and controlling agricultural pests first want proof that they are actually present in human populations to a degree that causes harm. As a first step toward resolving this debate, the NIEHS and the Centers for Disease Control and Prevention (CDC) are collaborating on a project for improving human exposure assessment for environmental endocrine disruptors. This collaboration will strengthen the science base for risk assessments, and will directly address some of the knowledge gaps that have helped to create the highly visible controversies that surround endocrine disruptors.

The initiative, which was launched in 1996 and funded by the NIEHS at a level of \$700,000 per year, directs the CDC to examine blood and urine samples of approximately 200 people for the presence of some 30 different compounds. The CDC is obtaining samples from the National Health and Nutrition Examination Survey's ongoing sampling of the general U.S. population. These samples are being

supplemented with others from various control groups known to have been exposed to one or more of the agents under study.

The study is presently at the halfway mark. During Fiscal Years 1996 and 1997, the CDC obtained reference range data on persistent compounds such as dioxins, DDT, mercury, and lead. Efforts in Fiscal Year 1998 are being devoted to data collection on non-persistent compounds including alkylated phenols, pyrethroids, and various pesticides. The CDC is also looking at phytoestrogens, naturally occurring plant compounds that can affect the endocrine system. Fiscal Year 1999 will be devoted to data collection on gasoline additives, cigarette additives, and more pesticides.

While data from these studies have not been officially published, certain trends are becoming evident. "Based on our [survey sample] results, the weight of evidence is that persistent compounds are decreasing in the U.S. human population," says Larry Needham, chief of the toxicology branch of the CDC's National Center for Environmental Health, located in Atlanta, Georgia. "This makes sense," he says, "given that many of these chemicals have been banned in the United States over the past few decades."

Based on this exposure assessment, the NIEHS and the CDC are proposing a broader interagency initiative that would include the EPA and the National Institute for Occupational Safety and Health as partners. The initiative is expected to benefit public health and the priority-setting process in a number of ways. It will provide the EPA with data critical for effective implementation of eventual revised risk assessment guidelines (particularly as they relate to cross-species extrapolation), the development of biologically based dose-response models, the identification of sensitive subpopulations, and estimates of risk based on the margin of exposure to toxicants that humans can

tolerate above the background levels likely to exist in their bodies.

The initiative will provide hazard information for use in prioritizing which of the 85,000 chemicals in commercial use today should be studied with the limited resources available for toxicological testing. Government agencies could also use the information obtained from the exposure initiative to focus their research on the effects in the body of exposure to mixtures of chemicals.

The initiative may also allow the nature of specific exposures to be more precisely determined. For example, if blood samples had been taken from U.S. military personnel before, during, and after the Persian Gulf War, many researchers believe it would be possible to determine the origins and nature of the mysterious illnesses many Gulf War veterans are now experiencing. The initiative will help to establish baseline data for future exposure situations.

Various subpopulations, including children, adults, the elderly, and the immunocompromised, are often exposed to varying degrees to different compounds. The exposure project will provide regulatory officials with information on the effects of chemicals on such potentially sensitive subpopulations so that risk guidelines can be set to protect them.

Taken together with the environmental genome initiative, the multiagency program will provide the scientific base necessary for meaningful studies on gene-environment interactions, particularly for strengthening the evaluation of epidemiological studies. Application of information from the genome project to disease prevention strategies will not be possible without good information on the kinds and amounts of chemicals in people's bodies. Finally, if body burden data are available over time, the efficacy of public health policies aimed at reducing human exposure to chemical agents can be better evaluated.

"The analytical methods available today are such that we can find a needle in a haystack when it comes to human exposure to chemical agents," says George Lucier, director of the NIEHS's Environmental Toxicology Program. "The question is, what is our level of exposure and how much is dangerous. This exposure assessment will bring the relevant agencies together to help answer these questions."

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